

The distribution of *Pisidium tenuilineatum* Stelfox and *Pisidium annandalei*
Prashad in the Mediterranean area

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INTRODUCTION

One of the interesting results of the intensified malacological field work of the two last decades in the Mediterranean area is the unexpected recording of *Pisidium tenuilineatum* Stelfox, 1918, at several widespread localities. These data invite a supplement of earlier papers (Kuiper, 1962a, 1963) on the geographical distribution of this species (fig. 1).

New facts are also reported on the presence of the taxonomically related southern Asiatic species *Pisidium annandalei* Prashad, 1925, in the eastern half of the Mediterranean area (fig. 1). A list of these records is given.

The Mediterranean area is here defined as follows: the northern African countries (from Morocco to Egypt), Spain, the seven French departments of the Mediterranean coast (Pyrénées-Orientales, Aude, Hérault, Gard, Bouches-du-Rhône, Var, Alpes-Maritimes), Italy, Yugoslavia, Albania, Greece, Turkey, Syria, Lebanon, Israel, Jordan.

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ABBREVIATIONS

(a). Public collections: HUJ = Hebrew University, Jerusalem; IBAP = Istituto di Biologia Animale, Padova; IiIP = Istituto Italiano di Idrobiologia, Pallanza; NHMW/E = Naturhistorisches Museum, Wien, collection A. Edlauer; RML = Rijksmuseum van Natuurlijke Historie, Leiden; SMF = Senckenberg Museum, Frankfurt/Main; ZMA/K = Instituut voor Taxonomische Zoölogie en Zoölogisch Museum, Amsterdam, collection of the author.

(b). Collectors: Bs = W. Backhuys; Bl = K. Bandel; Ed = A. Edlauer; Gd = A. Girod; Gi = G. Gafni; Gr = E. Gittenberger; Ha = R.A. Hamstra; Hn = L. Hässlein; Jl = S. Jaekel jr; Kh = R. Kinzelbach; Kn = M. Karaman; Kr = L. Kušcer; Mi = G. Marcuzzi; Mn = W.J.M. Maassen; Mo = J. Mouthon; Mr = H.C. Maier; Ms = H.K. Mienis; Ol = R. Ortal; Re = J. Rempe; Ro = D. Ruggio; Rz = P. Reischütz; Si = P. Subai; Sl = F. Stojaspal; St = H. Schütt; Ts = A. Tetens; Wh = A. Winneguth.

(c). Associated species of *Pisidium*: *amn* = *amicum* (Müller, 1774); *ann* = *annandalei* Prashad,

1925; *cas* = *casertanum* (Poli, 1791); *edl* = *edlaueri* Kuiper, 1960; *hen* = *henslowianum* (Sheppard, 1823); *lil* = *lilljeborgii* Clessin, 1886; *mil* = *miliunum* Held, 1836; *moi* = *moitessierianum* Paladilhe, 1866; *nit* = *nitidum* Jenyns, 1832; *per* = *personatum* Malm, 1855; *sub* = *subtruncatum* Malm, 1855; *subrec* = *subtruncatum recalvum* Kuiper, 1960; *ten* = *tenuilineatum* Stelfox, 1918.

Pisidium tenuilineatum Stelfox

Morocco. - In 1971 a Belgian expedition of the University of Gand collected living specimens in the Moyen Atlas at 1700 meters above sea-level in the Oued (= river) Mik-kés, near the Cascade des Vierges, 8 km from Ifram on the road to Meknès (Kuiper, 1972). It was the first record of this species in Africa. In Europe, *P. tenuilineatum* lives below the contour of 500 m.

Spain. - Luis Gasull, the well-known explorer of the non-marine malacofauna of the Balearic Islands, on 15 February 1966 collected a living specimen (ZMA/K 19017) of *P. tenuilineatum* in the Fuente al Bañador at Gandía, Valencia. This was the first record of the species in Spain. Associated species were: *amn*, *cas*, *moi*, *per* (Gasull, 1971). M.R. Alonso (1975) reported *P. tenuilineatum* from the Depression of Granada, 'en la bajada del puerto del Zegri', 930 m above sea-level. Although the presence of this species in the lower parts of the province of Granada is not improbable, it is evident that this is a misidentification, because the recorded mean measurements (length 3.5 mm, high 2.7 mm) are unlikely for this species. It is probably *P. subtruncatum* with concentric striation, a form often occurring in small streams.

France. - Department Var, Gapeau R. (length 34 km), running into the Mediterranean; numerous at some stations in the upper course at about 300 m above sea-level, less common down to 100 m, leg. Mo, IX.1979 (Coll. Mo; ZMA/K 18608).

Italy. - In a preliminary survey of the geographical distribution of *Pisidia* in Italy (Kuiper, 1964), *P. tenuilineatum* was not yet represented. The following localities are now known: Lago Maggiore, Bacino di Pallanza at a depth of 10 m, leg. Ro, 1970 (IIIP); Lago di Mergozzo, at depths between 10 and 15 m, *cas*, *lil*, *sub* (Nocentini, 1966); Milano, irrigation canal between Malvaglio and Cuggiono, leg. Gd, 13.V.1973, *amn*, *cas*, *sub* (Coll. Gd); Varese, Lago di Ganna, small lake traversed by the Margozzabbia R., leg. Gd, 11.IV.1976 (Coll. Gd), *sub* (Bianchi et al., 1978); Lago di Piano, immisario, leg. Gd, 20.V.1972, *amn*, *cas*, *per* (Coll. Gd); Lazio, Fiume San Susanna, bridge on the road from Rieti to Terni, leg. Hn, 22.IX.1969, *amn*, *cas*, *per*, *sub* (Coll. Hn); Latium, Lago di Bolsena, N. of Roma (a team of the IIIP collected *P. tenuilineatum* in 1967 and 1968 at depths of 10, 15, 18 and 21 m; at its greatest depth *P. tenuilineatum* was associated with *amn*, *cas*, *nit*, *per*, *sub*) (IIIP); Abruzzi, Pescara R., leg. Mi, 1975, *amn*, *cas*, *per*, *sub* (Marcuzzi & Faccipieri, 1976).

Jugoslavia. - The records are classified from North to South, in order of the federal republics or provinces: Slovenia (Krain is an old name used in former German publications; it now forms a part of Slovenia), Croatia (Slavonia included, as well as the major part of the former region Dalmatia), Bosnia-Herzegovina, Macedonia (only the northern part of the former region of this name, the southern part belongs to Greece).

- Slovenia. 'Krain, Krška jama', leg. Kr (NHMW/E 49840), *cas*, *hen*, *per*, *sub*; 'Krain, Meherschloß oder Wasserloch', leg. Kr (NHMW), *cas*, *mil*, *nit*, *per*, *sub*; 'Krain, Luče, 30 km von Ljubljana (= Laibach) gegen die Krka', leg. Kr (ZMA/K 15572, NHMW/E 49810), *cas*, *per*, *sub*; Krka R., leg. Kr (ZMA/K 4827), *cas*, *hen*, *per*; Rakov škojcan (= crayfish brook) near Postojna (= Adelsberg) E. of Ljubljana, leg. Mr c.s., 15.IX.1973, *cas*; Rakova

Kotlina near Postojna, leg. St, 10.VI.1958, *nit, sub* (Coll. St); 'Planina-Höhle, Rio de Gamberi' (Slg Schlickum -799 in SMF 280930); Planina, leg. Kr (NHMW/E 49843), *cas, per*; 'Caves of Planina', leg. Ha & Bs, IX.1971 (RML), *cas, per, sub*; 'Cavernone di Planina' (Coll. Gd), *cas, per, sub*; Malograjska Jama near Planina, leg. Re, 13.IX.1971 (Coll. Mn 2047); 'Krain, Kralograsska Jama', leg. Kr (NHMW/E 49841), *cas, nit, per, sub*; 'Krain, Tounjela Quelle', leg. Kr (NHMW/E 49846), *cas*; Ridovska jamapri, Studenem', leg. Kr (ZMA/K 4796), *amn*; 'Izvirek ob Krki Gabrovčec', leg. Kr (ZMA/K 15549), *cas, per*; Wippach near Dornberg (= Monte Spino) 10 km E. of Görz, leg. Ts, 25.VI.1929, *amn, cas, nit, sub* (Odhner, 1938: 228); Ljahn, near railway bridge S. of Vogersko-Görz (= Gorizia), right affluent of Wippach R. (Odhner, 1938: 228); Jesenica, 20 km N. of Plivice, subterranean river, *amn, cas, sub* (Odhner, 1938: 228). – Croatia. Dalmatia, Ribarić, N. of Sinj, leg. Kr (NHMW/E 17161 and 56005), *per, sub*. – Bosnia-Herzegovina. Ozalj along Kupa, NW. of Karlovac, *amn, cas, sub*, leg. Mn, VII.1979 (Coll. Mn); Source of Bunica near Hodbina, near Mostar, leg. St, 11.IX.1959 (Coll. St), *amn, cas, per, sub*; drift of the Miljacka near Sarajevo, leg. Wh (NHMW/E), *cas, sub*; drift of the Ilidža near Sarajevo (NHMW/E 20095), *cas, per, sub*; drift of the Zeljesnica near Ilidže, leg. Wh (NHMW/E; ZMA/K 4095), *cas, per, sub*. – Macedonia. Lake Ohrid, several records (Kuiper, 1960; Stanković, 1960: 357); 4 km S. of Ohrid, N. of Park Hotel, between shore and *Equisetum*, leg. Mn, 1975 (Coll. Mn; ZMA/K 20223), *cas, edl, hen, moi, subrec*; Sv. Naum, S. of Lake Ohrid, springs, leg. Mn, 7.V.1975 (Coll. Mn), *sub*.

Turkey. – Anatolia, Lake Egridir (Coll. Rz; ZMA/K 19491), *cas, hen, nit, sub*; Lake Egridir, Vilayet Isparta, leg. St, 11.V.1964 (Coll. St); Anatolia, Lake of Beyşehir, shore near village Yezildağ, leg. Sl, 9.X.1976 (ZMA/K 21265), *cas*.

Israel. – Tel Dan, in basin behind the dam, leg. Ms, 16.IX.1979, *cas, per* as well as *annandalei* (HUI); Nahal Dan, in sand pockets near the sources, leg. Ms, 16.IX.1979, *cas, per* and *annandalei* (HUI).

Psidium annandalei Prashad

Italy. – Sicily, 'Kyona Quelle bei Syrakus' (SMF 261733 Slg. JI); three Sicilian localities: Magnisi, Fiume Ciane and Fiume Anapo, *cas, nit, per* (Kuiper, 1962b); one Sicilian record without topographical details (Favre, 1943: 32, s.n. *vincentianum*); Campania, Sebeto River near Naples (Kuiper, 1962b).

Jugoslavia – Macedonia. – Spring near Raec R., affluent of Crna reka (Varda system), leg. Kn, 3.VIII.1970, *cas* (Coll. Kn).

Greece. – Kérkyra (= Corfu), stream near Sidari, *per* (Kuiper, 1962b); Kérkyra, River Messonghi near the bridge (Favre & Jayet, 1938: 400; Favre, 1943: 26, s.n. *vincentianum*); brooklet near bridge crossing the river 1 km W. of Messonghi, 16 km S. of Corfu town, leg. Gr, 17.IV.1979 (RML); Kefallinia (= Cephalonia), brooklet 0.5 km SE. of Pástra, 20 km SE. of Sámi, 200 m alt., leg. Gr, 23.VII.1980 (RML); Epiros, Igoumenitsa, spring S. of town, leg. Si, 22.VII.1975, *cas, per* (Coll. Mn; ZMA/K 21279); Epiros, stream St. Thomas near Prevesa (Favre & Jayet, 1938: 400; Favre, 1943: 46, s.n. *vincentianum*); Prevesa, Nikopolis (Altena, 1957: 132); Skafidaki near Prevesa, leg. C. Conemenos, 1889 (SMF 155885); Aetolia, Lake Trikhonis, SE. of Agrinion, near Bodina, leg. St, 11.V. 1960, *amn, mil, sub* (Coll. St); Cephise R. near Athens, *cas* (Favre, 1943); Euboea (Favre, 1943: 26, s.n. *vincentianum*); Crete, leg. Von Maltzan, 1883 (Altena, 1957: 132, s.n. *vincentianum*).

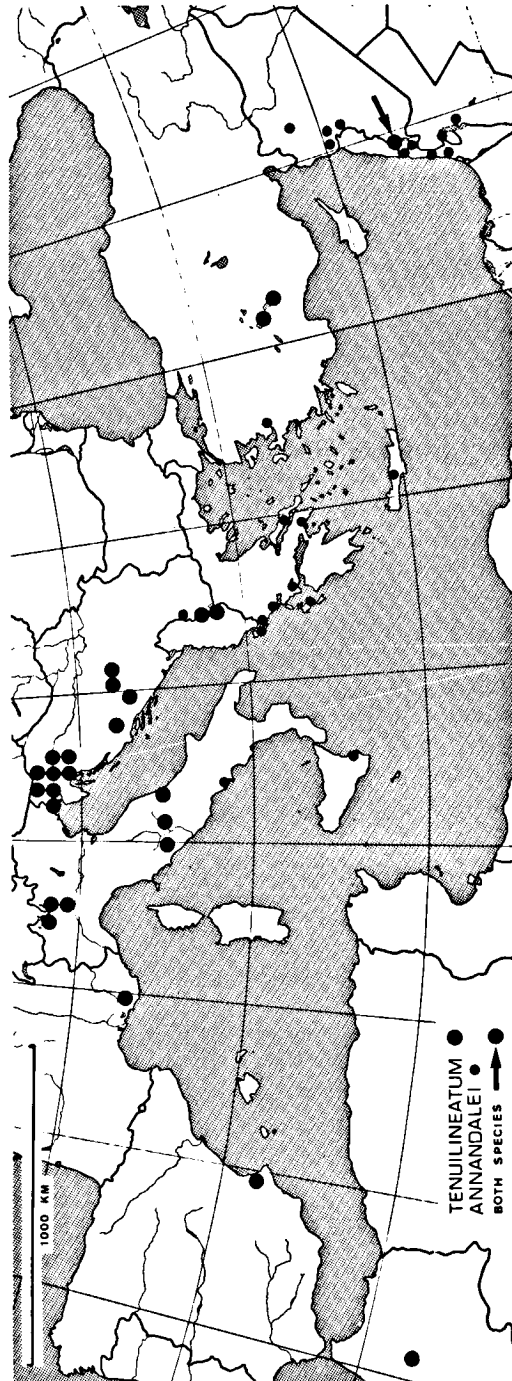


Fig. 1. Distribution of *Pisidium tenuilineatum* Stelfox and *P. annandalei* Prashad in the Mediterranean area (UTM 50 km grid map).

Turkey. – Surroundings of Izmir, leg. Basoglu, 6.II.1962 (SMF 167876); fossil specimens from Lower Pliocene Pisidian Formation, Denizli, from borehole at 100 and 70 m below surface (Becker-Platen & Kuiper, 1979), and from Upper Miocene at Kütahya, Aslanapa region, from borehole at 120 m below surface (Becker-Platen & Kuiper, 1979).

Syria. – Homs, Orontes R. near El Mimas, leg. K. Lindberg, 24.IX.1947, *cas* (Kuiper, 1962b); Orontes, in communication ditch near bridge on road from Homs to Tartūs, leg. Kh, 5.VIII.1978 (SMF 283124); Aïn Safsafe of southern affluent of the Awaaj, Hernion, 3 km S. of Saasaa, leg. Kh, 20.III.1980, *cas, per, sub* (Coll. St); Nahost-al-Jabbul near Jabbul, 5 km on the road from Haleb to Torbga, leg. Kh, 9.III.1980 (SMF 283127); Aïn Taga, 'Ost-Schleife d. Ghat', leg. Kh, 25.III.79 (SMF 283126); 'West-Schleife d. Ghat, 2. grosse Karstquelle bei dem Kreuzritterburg', leg. Kh, 22.III.1979 (SMF 283125).

Israel. – Ein (= spring) el Nuema, leg. Ol, 22.III.1978 (HUI); 'En (= spring, Hebrew) Dmomit, lower Nahal (= river) Shelef, leg. Gi, 26.III.1979, *cas* (HUI); 'En Nimfit, near Kfar Massaryk, leg. Gi, IX.1979, *per* (HUI); Ein Malkoach, 1 km S. of N. Berck, Jordan Valley, leg. Ms & Ol, 27.X.1977 (HUI; ZMA/K 21604); Tel Dan, Nahal Leish, in sand between water plants, leg. Ms, 16.IX.1979, *amn, cas, per, sub* (HUI); Tel Dan, in basin behind the dam, leg. Ms, 16.IX.1979, *cas, per, ten* (HUI); Ein Duyuk, NW. of Jericho, lower Jordan Valley, leg. Ms & Ol, 29.X.1977 (HUI); brook near eastern shore of Lake Huleh (Altena, 1957: 132, s.n. *vincentianum*); Jarkon near Tel Afek, leg. Ms, 31.I.1973 and 11.I.1977, *cas* (HUI); Wadi Furer near Jokneam, N. slope of Mount Carmel (Altena, 1957: 132, s.n. *vincentianum*); Nahal Shelef, leg. Ol, 1.III.1978 (HUI); Nahal Daligga, leg. Gi, 12.IX.1978 (HUI; ZMA/K 21613); Nahal Yiftahel near Horvat, leg. Gi, 24.III.1979 (HUI; ZMA/K 21612); Jarkon (Nahr Auja), drift N. of Tel Aviv (Altena, 1957: 132, s.n. *vincentianum*); Nahal Dan, in sand pockets near the sources, leg. Ms, 16.IX.1979, *cas, per, ten* (HUI).

Jordan. – Hishan spring, leg. Bl, IV.1978 (Coll. St; ZMA/K 22073); Wadi Seer, clear spring, leg. Bl, IV.1978 (Coll. St).

GENERAL REMARKS

The geographical distribution of *Pisidium tenuilineatum* may be defined, as far as known, as western Palaearctic. Its taxonomically nearest ally, *P. annandalei*, on the other hand, has a mainly southern Asiatic distribution. *P. tenuilineatum* occurs N. of the Alps and below the contour of 500 m from Ireland and southern Sweden eastward to central Russia and S. of the Alps from Morocco and Spain eastward to Israel and Jordan. *P. annandalei* is widely distributed in plains and hills of lower altitudes from the eastern half of the Mediterranean region eastward, and S. of the Himalayas, as far east as the Philippines. The geographical areas of distribution of both species overlap in the sector between Macedonia and Israel.

P. tenuilineatum lives in rivers, canals, streams, brooks and in the littoral zone of large lakes, rarely in springs. *P. annandalei* has mainly been collected in small streams and in springs. In spite of their apparent ecological similarity, the two species rarely share the same habitat. Only in Israel (Tel Dan and Nahal Dan) have they been found in association. This curious fact deserves to be studied more fully.

A late Miocene record of *P. annandalei* as far North as Bavaria (Schlickum, 1964) is an indication that this species has once lived in central Europe. Shells of late Miocene and early Pliocene age from Turkey (Becker-Platen & Kuiper, 1979) prove that *P. annandalei*

is an autochthonous faunistic element of the eastern sector of the Mediterranean area. The origin of *P. tenuilineatum* in the Mediterranean area remains uncertain as long as fossil records are lacking.

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SAMENVATTING

Veel recente vondsten van *Pisidium tenuilineatum* Stelfox in de landen rond de Middellandse Zee hebben in belangrijke mate het verspreidingsbeeld van deze soort, die als Noordwest-Europees en boreo-alpien gold, gewijzigd. Haar areaal kan men nu als volgt omschrijven: benoorden de Alpen, van Ierland oostwaarts tot midden-Rusland, noordwaarts tot Zuid-Zweden; bezuiden de Alpen, van Marokko en Spanje oostwaarts tot Turkije en Israël. Van Macedonië tot Israël overlapt het verspreidingsgebied van *P. tenuilineatum* dat van de vermoedelijk nauw verwante Aziatische soort *P. annandalei* Prashad, die van Sicilië af oostwaarts door heel Zuid-Azië ten Zuiden van de Himalaya tot de Filipijnen toe voorkomt. Tertiaire vondsten in Turkije bewijzen, dat *P. annandalei* er een oud fauna-element is. Van *P. tenuilineatum* daarentegen, zijn geen fossiele vondsten van bezuiden de Alpen bekend. Oecologisch is *P. annandalei* nog niet duidelijk gedefinieerd. Het natuurreservaat Tel Dan in Israël is de tot nu toe enig bekende vindplaats waar beide soorten in dezelfde biotoop leven.